



## Total Serum Cholesterol Level in Cases of Carcinoma Breast – A Correlative Study

S. Shamshad Ahmad, Sabina Ashraf<sup>#</sup>, Arshad Jamal<sup>2</sup> and Kafil Akhtar<sup>1\*</sup>

<sup>1\*</sup>Department of Pathology, <sup>2</sup>Surgery & <sup>#</sup>Emergency, Jawaharlal Nehru Medical College, A.M.U., Aligarh-202001, India.

### Abstract

**Aims and Objective:** Correlation between serum cholesterol level and risk of breast cancer.

**Material and Methods:** Fifty histologically diagnosed breast cancer patients were included in the study. Patients were grouped according to the size, histological type of the tumor and lymph node involvement. Patient's total serum cholesterol levels were measured a week prior to the operation and on the 14<sup>th</sup> day postoperatively. Fifty age-matched non-cancer females were treated as a control.

**Observations:** The pre and postoperative mean total serum cholesterol (MTSC) was found to be  $272.3 \pm 43.4$ mg/dl and  $210.54 \pm 31.5$ mg/dl respectively. An MTSC level in fifty control cases was found to be  $183.42 \pm 34.4$ mg/dl. Patients with tumor size less than 5cms showed preoperative mean serum cholesterol levels of  $261.6 \pm 36.5$ mg/dl and a postoperative value of  $201.9 \pm 16.9$ mg/dl while those with tumor size more than 10cms showed a mean serum cholesterol level of  $282.36 \pm 64.8$ mg/dl preoperatively and  $211.82 \pm 53.15$ mg/dl postoperatively. Thirty patients with scirrhous type of carcinoma had a preoperative mean serum cholesterol level as  $237.36$ mg/dL, and twelve patients with a colloid type of carcinoma showed a preoperative level of  $294.9 \pm 18.4$ mg/dL whereas eight patients with medullary type of carcinoma showed the highest preoperative level of  $324.3 \pm 19.8$ mg/dL, whereas the corresponding postoperative values were  $202.9 \pm 30.0$ mg,  $216.8 \pm 27.8$ mg and  $229.4 \pm 29.8$ mg respectively.

**Conclusions:** The present study helps us to conclude that dietary habits affect the association of cholesterol in breast cancer and size, histology with tumor metastasis effects such relationship.

**Keywords:** Breast Cancer, Serum Cholesterol, Prognosis.

### 1. Introduction

Breast cancer is a major cause of death in older females. Investigations like aspiration cytology, biopsy, mammography, sonography, computerized scanning and many biochemical parameters now help to diagnose the lesions in its infancy before the life of patients is endangered.

For long, a number of workers have undertaken studies on metabolic chemistry in relation to Cancer. Chao *et al.*,<sup>1</sup> concluded in their study that decrease in serum cholesterol level was related to the mortality of cancer patients. When the serum cholesterol levels fell to less than half their initial levels chances of mortality

increased. Rose and Simpley<sup>2</sup> observed the correlation between low serum cholesterol level and an increased risk of cancer. They also explored the possibility that rather than low serum cholesterol levels predisposing to cancer, existing cancer at the time of serum cholesterol measurement may cause the cholesterol levels to decrease. This "preclinical cancer effect" could yield the apparent correlation between lower serum cholesterol level and cancer mortality. Alexopoulos *et al.*,<sup>3</sup> carried out a study on 103 cancer patients (60 men and 43 women, with a mean age group of 56 years) and 100 age-matched non-cancer patients to infer that cancer patients showed significantly lower serum cholesterol level as compared to the non-cancer

\*Corresponding author:  
E-mail: drkafilakhtar@gmail.com.

patients, with the only exception of the breast cancer patients who revealed raised serum total cholesterol levels.

## 2. Material and Methods

Fifty cytologically and histologically diagnosed breast cancer patients (with a mean age group of 57.7 years) attending surgery outpatient and inpatient of Jawaharlal Nehru Medical College, Aligarh were included in the study. Patients were grouped according to the size, histological type of the tumor and lymph node involvement. Patient's total serum cholesterol levels were measured a week prior to the operation and on the 14<sup>th</sup> day postoperatively. Fifty age-matched non-cancer females (with a mean age group of 56.5 years) were treated as a control.

The criteria for selection of patients with reference to the control were age, weight, blood pressure, dietary habit and economic status, 32 patients were non-vegetarian and 18 were vegetarian and none of the females were smoker or alcoholic. In the control group, also 32 were non-vegetarian and 18 were vegetarian.

The fifty pre-treatment breast cancer patients were investigated by fine needle aspiration cytology (FNAC) and later confirmed by histopathology after operation. The diagnoses by both methods were 100% the same, although FNAC was repeated in 17 out of 50 patients because of scanty material or hemorrhagic smears.

3ml venous blood was drawn after 12 hours fasting, taken in the sterilized plain vials, and allowed to clot, undisturbed at 37°C. Serum was separated by centrifugation at 4000rpm for 10 min. and stored at 20°C till the cholesterol estimation was done.

Hemolysed samples were discarded. Serum cholesterol estimation was done on semi autoanalyzer (Ranbaxy BTR - 820) on the principle of CHOD -PAP (Enzo kit - cholesterol).<sup>4</sup>

## 3. Observations

The pre and postoperative mean total serum cholesterol (MTSC) in fifty breast cancer patients with mean age of 57.2 yrs was found to be  $272.3 \pm 43.4$ mg/dl and  $210.54 \pm 31.5$ mg/dl respectively, and MTSC levels in fifty control cases, with a mean age group of 58.4 years, were found to be  $183.4 \pm 34.4$ mg/dl (Table 1).

Patients with tumor size less than 5 centimeters (cms) showed preoperative mean serum cholesterol levels of  $261.6 \pm 36.5$ mg/dl and a postoperative value of  $201.9 \pm 16.9$ mg/dl, those with tumor size between 5.1 - 10cms showed preoperative mean serum cholesterol level of  $265.8 \pm 41.1$ mg/dl and  $206.4 \pm 27.3$ mg/dl postoperatively while those with tumor size more than 10cms showed mean serum cholesterol level of  $282.4 \pm 64.8$ mg/dl preoperatively and  $211.8 \pm 53.2$ mg/dl postoperatively (Table 2).

Thirty patients with scirrhus type of carcinoma had a preoperative mean serum cholesterol level as 237.4mg/dl, and twelve patients with a colloid type of carcinoma showed a preoperative level of  $294.9 \pm 18.4$ mg/dl whereas eight patients with medullary type of carcinoma showed the highest preoperative level of  $324.3 \pm 19.8$ mg/dl, whereas the corresponding postoperative values were  $202.9 \pm 30.0$ mg,  $216.8 \pm 27.8$  mg and  $229.4 \pm 29.8$ mg respectively (Table 3).

Table 1. Mean Total Serum Cholesterol levels in control and test groups.

Groups	No. of cases	Pre-op Serum Cholesterol (mg/dl)		Post-op Serum Cholesterol (mg/dl)	
		Range	Mean + S.D.	Range	Mean + S.D.
Control	50	138.8 - 286.0	$188.4 \pm 34.4$	-	-
Test	50	173.0 - 349.5	$272.4 \pm 24.4$	148.0 - 280.6	$210.5 \pm 31.3$

Table 2. Mean Total Serum Cholesterol levels according to tumor size.

Size of Tumor	No. of cases	Pre-op Serum Cholesterol (mg/dl)		Post-op Serum Cholesterol (mg/dl)	
		Range	Mean + S.D.	Range	Mean + S.D.
≤ 5cms	22	173 - 338	$261.4 \pm 54.8$	148.0 - 280.6	$214.8 \pm 54.2$
5.1-10cms	18	206.3 - 334.0	$265.8 \pm 41.1$	156.0 - 253.0	$206.4 \pm 27.3$
> 10cms	10	208.0 - 349.5	$282.7 \pm 36.5$	148.0 - 280.6	$211.9 \pm 16.9$

Table 3. Mean Total Serum Cholesterol levels according to histological type.

Histological type	No. of cases	Pre-op Serum Cholesterol (mg/dl)		Post-op Serum Cholesterol (mg/dl)	
		Range	Mean + S.D.	Range	Mean ± S.D.
Colloid	12	280.0 - 334.0	$280.0 \pm 334.0$	167.5 - 253.0	$216.8 \pm 27.8$
Medullary	08	298.0 - 349.5	$298.0 \pm 349.5$	206.0 - 280.6	$229.1 \pm 29.8$
Scirrhus	30	173.0 - 304.3	$250.4 \pm 97.4$	148.0 - 270.0	$202.9 \pm 30.1$

The preoperative and postoperative mean serum cholesterol levels in twenty-eight patients with lymph node involvement came out to be  $303.2 \pm 26.1$ mg/dl and  $223.5 \pm 28.2$ mg/dl respectively, while in patients without any lymph node involvement, these values were  $248.1 \pm 36.8$ mg/dl and  $200.3 \pm 29.4$ mg/dl respectively.

### 3. Discussion

The main finding of the present study was the exceptionally raised pre-treatment serum total cholesterol level in patients of carcinoma breast, consistent with the findings of Chao *et al.*,<sup>2</sup> and Alexopoulos *et al.*,<sup>3, 5</sup> rather than the usual inverse relation of cholesterol and cancer. Although, several workers like Knekt *et al.*,<sup>6</sup> Smith *et al.*,<sup>7</sup> and Alexopoulos<sup>5</sup> have agreed for the inverse relationship between cholesterol level and cancer incidence and mortality but Chao *et al.*,<sup>2</sup> pointed to early mortality from various site-specific body cancer except for carcinoma breast, ovary and Hodgkins disease, when serum cholesterol decreased to half the initial levels. Alexopoulos *et al.*,<sup>3,5</sup> demonstrated that cancer patients as a group revealed significantly lower total serum cholesterol values compared with the controls except for the breast cancer patients who revealed raised total serum cholesterol.

In this study, 32 out of 50 patients were non-vegetarian, which explains the hypothesis that increased dietary fat intake is positively associated with risk of breast cancer.<sup>8,9</sup> The mean age of cases in the control and test groups were 58.5 and 57.7 years respectively, almost similar to the studies of Alexopoulos<sup>3,5</sup>. The mean total serum cholesterol (MTSC) level in control cases was found to be  $188.4 \pm 34.4$ mg/dl, compared with the finding of Alexopoulos *et al.*,<sup>3</sup>. The pre-treatment MTSC levels of all breast cancer cases was  $272.3 \pm 43.3$ mg/dl; very similar to the findings of Knekt *et al.*,<sup>6</sup> but higher than the findings of Alexopoulos *et al.*,<sup>3,5</sup>, who have reported that untreated breast cancer is associated with hypercholesterolemia in contrast to most other tumors. The post-treatment MTSC levels were found to be  $210.5 \pm 31.5$ mg/dl, a value very similar to the findings of Alexopoulos *et al.*,<sup>5</sup>. In our study, the moderate difference between pre-treatment and post-treatment values of MTSC ( $p < 0.05$ ) could be due to surgical trauma, blood loss and decreased desire of intake.

Alexopoulos *et al.*,<sup>5</sup> have reported that pre-treatment hypercholesterolemia can be reversed by effective treatment, and breast cancer patients demonstrated an inverse pattern of change after completion of chemotherapy as compared to other groups of patients, their total serum cholesterol levels decreased instead of increasing, after therapy.

Patients with breast tumor of a size less than 5cm, between 5.1 - 10cm and more than 10cm, exhibited a

pre-treatment MTSC level of  $261.3 \pm 54.8$ mg/dl,  $265.8 \pm 41.2$ mg/dl and  $282.7 \pm 4$ mg/dl respectively, and a post-treatment MTSC level of  $206.1 \pm 16.9$ mg/dl,  $211.5 \pm 27.3$ mg/dl and  $214.8 \pm 53.2$ mg/dl respectively. The pre-treatment and post-treatment differences in serum cholesterol levels in various sizes of tumors were insignificant, although there was a gradual surge in serum cholesterol levels with increasing size.

The histology of the carcinoma affected the serum cholesterol values as reported by Schatzkin *et al.*,<sup>10</sup>, who suggested that the inverse relation between cholesterol and cancer was more prominent for cancers of squamous epithelial than glandular epithelium. Thus, it would be of interest to examine the relation of cholesterol and cancer by histology prototypes. Keeping this aspect into account the present study showed varying levels of serum cholesterol levels with histological subtypes of breast cancers; with lowest level in cirrhotic and highest level in medullary carcinomas. The preoperative cholesterol levels gradually showed an increasing trend with significant variation ( $p < 0.001$ ) in three histological types of scirrhous, colloid to medullary carcinoma but postoperative readings were comparatively insignificant.

The lymph node metastasis had an effect on serum cholesterol levels with the pre-treatment MTSC values of patients with Lymph node involvement, which was significantly higher than those without lymph node involvement was  $248.1 \pm 38.6$ mg/dl. The post-treatment values for both came out to be insignificant in the present study.

The present study helps us to conclude that dietary habits affect the association of cholesterol in breast cancer and size, histology and metastasis of the tumor effect such relationship.

### References

- [1]. Chao, F.C., Efron, B., Wolf, P. (1975). The possible prognostic usefulness of assessing serum proteins and cholesterol in malignancy. *Cancer*, 35: 1223-1229.
- [2]. Rose, G., Shipley, M.J. (1980). Plasma lipids and mortality: A source of error. *Lancet*, 1: 523-526.
- [3]. Alexopoulos, C.G., Blatsios, B., Avgerinos, A. (1987). Serum lipids and lipoprotein disorders in cancer patients. *Cancer*, 60: 3065-3070.
- [4]. Allain, C.C., Poon, L.S., Chan, C.S., Richmond, W., Fu, P.C. (1974). Enzymatic determination of total serum cholesterol. *Clin. Chem.*, 20: 470-475.
- [5]. Alexopoulos, C.G., Pournaras, S., Vaslamatzis, M., Avgerinos, A., Raptis, S. (1992). Changes in serum lipids and lipoproteins in cancer patients during chemotherapy. *Cancer Chemother. Pharmacol.*, 30: 412-416.
- [6]. Knekt, P., Reunanen, A., Aromaa, A., Heliövaara, M., Hakulinen, T., Hakama, M. (1988). Serum

- cholesterol and risk of cancers in a cohort of 39,000 men and women. *J. Clin. Epidemiol.*, 41: 519-530.
- [7]. Smith, C.D., Shipley, M.J., Marmot, M.G., Rose G. (1992). Plasma Cholesterol concentration and mortality: The Whitehall study. *JAMA*, 267: 70-76.
- [8]. Miller, A.B., Kelly, A., Choi, N.W., Matthews, V., Morgan, R.W., Munan, L., Burch, J.D., Feather, J., Howe, G.R., Jain, M. (1978). A study of diet and breast cancer. *Am. J. Epidemiol.*, 107: 499-509.
- [9]. Hiatt, R.A. and Fireman, B.H. (1986). Serum cholesterol and the incidence of cancer in a large cohort. *J. Chronic. Dis.*, 39: 861-870.
- [10]. Schatzkin, A., Hoover, R.N., Taylor, P.R., Ziegler, R.G., Carter, C.L., Albanes, D., Larson, D.B., Licitra, L.M. (1988). Site-specific analysis of total serum cholesterol and incident cancer in the National Health and Nutrition Examination Survey I Epidemiological Follow-up Study. *Cancer Research*, 48: 452-458.